



09/7/1762

CH

## HESLIN ROTHENBERG FARLEY & MESITI P.C.

Robert E. Heslin  
Jeff Rothenberg  
Kevin P. Radigan  
Susan E. Farley  
Nicholas Mesiti  
Philip E. Hansen\*  
Blanche E. Schiller  
Wayne F. Reinke  
David P. Miranda

\* Patent Agent

### INTELLECTUAL PROPERTY LAW PATENTS • TRADEMARKS • COPYRIGHTS

Attorneys at Law  
5 Columbia Circle  
Albany, New York 12203  
Telephone: (518) 452-5600  
Facsimile: (518) 452-5579  
www.hrfmlaw.com

July 20, 2005

Kathy Smith Dias  
David A. Pascarella  
Victor A. Cardona  
Lee Palmateer  
John Pietrangelo\*  
Brett M. Hutton  
Stephen M. Hladik  
Edward Timmer  
Alana M. Fuierer  
John W. Boger

Of Counsel  
Martha L. Boden  
Jill M. Breedlove

Joseph L. Spiegel  
Poughkeepsie, NY

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Re: Correction of Mistake in Printed Patent  
Under §1480 of the Manual of Patent  
Examining Procedures  
U.S. Patent No.: 6,914,939  
Date of Patent: July 5, 2005  
Inventor(s): Boice et al.  
IBM Docket No.: END92000090US1  
Our File No.: 0827.075

Certificate  
AUG 01 2005  
of Correction

Dear Sir: \*

Upon proofreading the sealed patent, we noticed an error made by the Patent Office.

Transmitted herewith is a proposed Certificate of Correction effecting a corrective amendment.

The patentee respectfully solicits the granting of the requested Certificate of Correction.

Respectfully submitted,

Kevin P. Radigan, Esq.  
Registration No. 31,789  
Attorney for Applicants

KPR/cma  
Enclosure

UNITED STATES PATENT AND TRADEMARK OFFICE

**CERTIFICATE OF CORRECTION**

PATENT NO. 6,914,939  
 DATED July 5, 2005  
 INVENTOR(S) Boice et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Specification:

Col. 9, lines 1-15, insert the following Formula (4) structure in place of the structure on the sealed patent:

$$\begin{aligned}
 Z_{F,d45} = & (g_1 + g_2 + g_3)^{-1} (m_r - 1)^{-1} (m_c - 1)^{-1} \sum_{i=1}^{m_r-1} \sum_{j=0}^{m_c-2} g_1 |y_t(i,j) - y_t(i-1,j+1)| \\
 & + (n_r - 1)^{-1} (n_c - 1)^{-1} \sum_{i=1}^{n_r-1} \sum_{j=0}^{n_c-2} g_2 |cb_t(i,j) - cb_t(i-1,j+1)| \\
 & + (n_r - 1)^{-1} (n_c - 1)^{-1} \sum_{i=1}^{n_r-1} \sum_{j=0}^{n_c-2} g_3 |cr_t(i,j) - cr_t(i-1,j+1)|
 \end{aligned} \tag{4}$$

MAILING ADDRESS OF SENDER:

Kevin P. Radigan, Esq.  
 Heslin Rothenberg Farley & Mesiti P.C.  
 5 Columbia Circle  
 Albany, New York 12203  
 Telephone: (518) 452-5600  
 Facsimile: (518) 452-5579

PATENT NO.:

No. of add'l copies  
 @ .50 per page

9

-continued

$$Z_{F,d45} = (g_1 + g_2 + g_3)^{-1} \left( (m_r - 1)^{-1} (m_c - 1)^{-1} \sum_{i=1}^{m_r-1} \sum_{j=0}^{m_c-2} g_1 |y_i(i, j) - y_i(i-1, j+1)| + \right. \\ \left. (n_r - 1)^{-1} (n_c - 1)^{-1} \sum_{i=1}^{n_r-1} \sum_{j=0}^{n_c-2} g_2 |cb_i(i, j) - cb_i(i-1, j+1)| + (n_r - 1)^{-1} (n_c - 1)^{-1} \sum_{i=1}^{n_r-1} \sum_{j=0}^{n_c-2} g_3 |cr_i(i, j) - cr_i(i-1, j+1)| \right) \quad (4)$$

$$Z_{F,d135} = (g_1 + g_2 + g_3)^{-1} \left( (m_r - 1)^{-1} (m_c - 1)^{-1} \sum_{i=0}^{m_r-2} \sum_{j=0}^{m_c-2} g_1 |y_i(i, j) - y_i(i+1, j+1)| + \right. \\ \left. (n_r - 1)^{-1} (n_c - 1)^{-1} \sum_{i=0}^{n_r-2} \sum_{j=0}^{n_c-2} g_2 |cb_i(i, j) - cb_i(i+1, j+1)| + (n_r - 1)^{-1} (n_c - 1)^{-1} \sum_{i=0}^{n_r-2} \sum_{j=0}^{n_c-2} g_3 |cr_i(i, j) - cr_i(i+1, j+1)| \right) \quad (5)$$

Field-based statistical measures for interlaced pictures, where frame encoding mode is considered, are calculated as:

$$Z_{f,v} = \frac{f_1 Z_{f,v}^{top} + f_2 Z_{f,v}^{bot}}{f_1 + f_2}$$

$$Z_{f,d45} = \frac{f_1 Z_{f,d45}^{top} + f_2 Z_{f,d45}^{bot}}{f_1 + f_2}$$

$$Z_{f,d135} = \frac{f_1 Z_{f,d135}^{top} + f_2 Z_{f,d135}^{bot}}{f_1 + f_2}$$

with  $f_1=1.0$  and  $f_2=1.0$ , and top and bot representing top and bottom fields of an interlaced frame, respectively. Each line of the top field of an interlaced frame is spatially located above a line of the bottom field of the same frame. Components of equations (6), (7) and (8) can be computed as:

$$Z_{f,v}^x = (g_1 + g_2 + g_3)^{-1} \left( (m/2 - m_c)^{-1} \sum_{i=0}^{m_c-1} \sum_{j=0}^{m_r/2-2} g_1 |y_i(2i + o_x, j) - y_i(2(i+1) + o_x, j)| + \right. \\ \left. (n/2 - n_c)^{-1} \sum_{i=0}^{n_c-1} \sum_{j=0}^{n_r/2-2} g_2 |cb_i(2i + o_x, j) - cb_i(2(i+1) + o_x, j)| + (n/2 - n_c)^{-1} \sum_{i=0}^{n_c-1} \sum_{j=0}^{n_r/2-2} g_3 |cr_i(2i + o_x, j) - cr_i(2(i+1) + o_x, j)| \right) \quad (9)$$

10

-continued

$$Z_{f,d45}^x = (g_1 + g_2 + g_3)^{-1} \times \left( (m_r/2 - 1)^{-1} (m_c - 1)^{-1} \sum_{i=1}^{m_r/2-1} \sum_{j=0}^{m_c-2} g_1 |y_i(2i + o_x, j) - y_i(2(i-1) + o_x, j+1)| + (n_r/2 - 1)^{-1} (n_c - 1)^{-1} \sum_{i=1}^{n_r/2-1} \sum_{j=0}^{n_c-2} g_2 |cb_i(2i + o_x, j) - cb_i(2(i-1) + o_x, j+1)| + (n_r/2 - 1)^{-1} (n_c - 1)^{-1} \sum_{i=1}^{n_r/2-1} \sum_{j=0}^{n_c-2} g_3 |cr_i(2i + o_x, j) - cr_i(2(i-1) + o_x, j+1)| \right) \quad (10)$$

$$Z_{f,d135}^x = (g_1 + g_2 + g_3)^{-1} \times \left( (m_r/2 - 1)^{-1} (m_c - 1)^{-1} \sum_{i=0}^{m_r/2-2} \sum_{j=0}^{m_c-2} g_1 |y_i(2i + o_x, j) - y_i(2(i+1) + o_x, j+1)| + (n_r/2 - 1)^{-1} (n_c - 1)^{-1} \sum_{i=0}^{n_r/2-2} \sum_{j=0}^{n_c-2} g_2 |cb_i(2i + o_x, j) - cb_i(2(i+1) + o_x, j+1)| + (n_r/2 - 1)^{-1} (n_c - 1)^{-1} \sum_{i=0}^{n_r/2-2} \sum_{j=0}^{n_c-2} g_3 |cr_i(2i + o_x, j) - cr_i(2(i+1) + o_x, j+1)| \right) \quad (11)$$

where  $x$  represents the type of field, i.e., top or bot, and for  $x=top$ ,  $0_x=0_{top}=0$  and for  $x=bot$ ,  $0_x=0_{bot}=1$ . For the case where the encoder is set in the field encoding mode, each picture is stored in the memory unit of FIG. 1 as a field. In this case, all inter-pixel statistical measures are computed using equations (2), (3), (4), and (5) with  $m_r$  and  $n_r$  taking on the field resolutions for luminance and chrominance components, respectively. Finally, an example for values of  $g_1=2.0$ ,  $g_2=1.0$ , and  $g_3=1.0$ .

In accordance with one embodiment of the present invention, a set of picture-based statistical measures ( $Z_h$ ,  $Z_{F,v}$ ,  $Z_{F,d45}$ ,  $Z_{f,d45}$ ,  $Z_{F,d135}$  and  $Z_{f,d135}$ ) are fed to the picture difficulty evaluator 124 of FIG. 2. Depending on the encoder's mode of operation or the nature of the input source, a sub-set of statistical indicators are computed and sent to the difficulty measure comparator. For example, if the user knows the source is progressive, only  $Z_h$ ,  $Z_{F,v}$ ,  $Z_{F,d45}$ , and  $Z_{F,d135}$  are calculated with the proper frame resolutions, and all switches 125 corresponding to these indicators are turned on in FIG. 2. If the source is interlaced and the user sets the encoder in field encoding mode, again the indicators  $Z_h$ ,  $Z_{F,v}$ ,  $Z_{F,d45}$ , and  $Z_{F,d135}$  are calculated, this time with field resolutions. For the aforementioned cases a final statistical measure  $Z_{max}$  is obtained by a difficulty measure comparator 126 such that:

$$Z_{max} = \text{MAX}(Z_h, Z_{F,v}, Z_{F,d45}, Z_{F,d135}) \quad (12)$$

If the user sets the encoder for frame encoding mode of an interlaced source, all seven inputs to picture difficulty evaluator of FIG. 2 are present and computed, i.e.,  $Z_h$ ,  $Z_{F,v}$ ,  $Z_{f,v}$ ,  $Z_{F,d45}$ ,  $Z_{f,d45}$ ,  $Z_{F,d135}$ , and  $Z_{f,d135}$ . This means that all switches 125 to picture difficulty evaluator 124 of FIG. 2 are